Space Weather Forecast

Issued on Sunday, 15 September 2024 at 13:24 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Further Moderate flares expected with a chance of isolated Strong flares. G1-G2/Minor-Moderate Geomagnetic storms expected 16 Sep, with a chance of G3/Strong storm intervals and slight chance of peak G4/Severe storm conditions due to a forecast fast coronal mass ejection arrival.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: High with a mid-level Strong flare observed at 14/1529 UTC originating from a moderately large sunspot in the southeast.

There are five sunspot regions on the disc with the most active sunspot group located in the southeast. This region exhibited growth in its intermediate and trailing spots, including development of a complex magnetic configuration. Emergence of a small group in the southwest disc occurred, but previous growth has slowed and has demonstrated only minor flare activity. Three small, simple regions all rotated over the southwest horizon. The remaining regions on the disc were stable and inactive during the period.

A fast Coronal Mass Ejection (CME) in the southeast occurring from the aforementioned Strong flare has been analysed as having an Earth-directed impact on day 2 (16 Sep). Numerous other CMEs were observed but these are not deemed to be Earth-directed.

Solar Wind / Geomagnetic Activity: Solar wind parameters were slightly enhanced during the period, with wind speeds increasing from near background to between slightly elevated and elevated speeds, peaking 575 km/s at 15/0817 UTC. The Interplanetary Magnetic Field (IMF) Bt, was Weak to Moderate, while the north-south component, Bz, was erratic but remained largely negative, peaking at weakly negative values. The net result of these parameters was for Quiet to Active geomagnetic activity (Kp 2-4).

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) has risen since the strong flare on 14 Sep but remains below the S1/Minor Storm threshold at this time.

Four-Day Space Weather Forecast Summary

Solar Activity: Moderate to High activity is forecast, with further Moderate flares expected, and a chance of Strong flares. These most likely from the large sunspot group in the southeast.

Solar Wind / Geomagnetic Activity: There are up to two CME arrivals and the potential for up to three coronal hole fast winds which feature in the forecast. The most significant feature is the 14 Sep CME which may bring Strong or Very Strong solar winds at Earth on day 2 (16 Sep), with a small chance this may arrive early, by late day 1 (15 Sep). This feature may have lingering effects into day 3 (17 Sep) combined with the second coronal hole fast wind. A third coronal hole fast wind may arrive day 4 (18 Sep), with slightly elevated to elevated speeds expected.

Generally Quiet to Active geomagnetic activity is expected day 1 (15 Sep) with a chance of G1-G3/Minor-Strong storm conditions and a very slight chance of G4/Severe storms should the 14 Sep CME arrive earlier than forecast. The 14 Sep CME should arrive on day 2 (16 Sep) with G1-

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G2/Minor-Moderate storming expected, but a chance of peak G3/Strong Storm levels and a slight chance of G4/Severe storm intervals occurring. These risks reduce into days 3 and 4 (17 and 18 Sep) due to waning CME and coronal hole fast wind effects.

Aurora: Auroral activity is expected to peak either late Sunday (15 Sep) or more likely on Monday (16 Sep), following the anticipated arrival of the fast CME that left the Sun on 14 Sep (Saturday). This is forecast to bring aurora visible to the naked eye across Scotland, Northern Ireland and perhaps parts of England, although peak geomagnetic activity is expected to occur during daylight hours. Lingering effects may then continue into the following night, once again with aurora sightings likely across Scotland, Northern Ireland and perhaps parts of England and Wales on the night of Tuesday 17 September.

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) has risen after the Strong flare on 14 Sep, but remains below the S1/Minor Storm threshold. There is still a chance that S1 proton storm levels may be reached day 1 and 2 (15 and 16 Sep), this risk reducing later in the period.

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Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	40	80	50	20
Strong	G3	No	20	40	20	2
Severe	G4	No	5	15	2	1
Extreme	G5	No	2	5	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	Yes	70	70	70	70
Very Active	R3 to R5 X	Yes	20	20	20	20

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	30	20	10	10
Very Active	≥ S3 *	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

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